CBCS SCHEME

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18EC32

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Network Theory

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define the following network terminology
i) Network element ii) Branch iii) Node iv) Mesh. **(08 Marks)**

b. Determine the voltage at node 2 in the circuit shown in Fig Q1(b) source transformation.

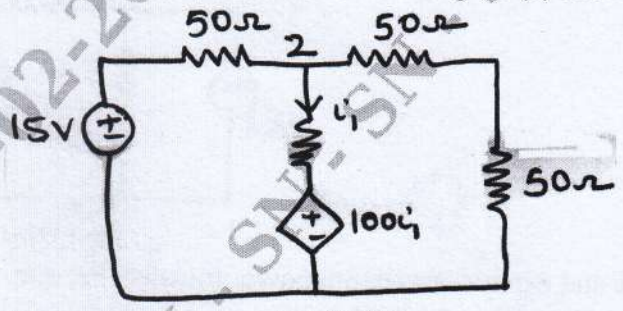

Fig Q1(b) **(06 Marks)**

c. Determine the equivalent resistance between the terminals A and B for the circuit shown in Fig Q1(c).

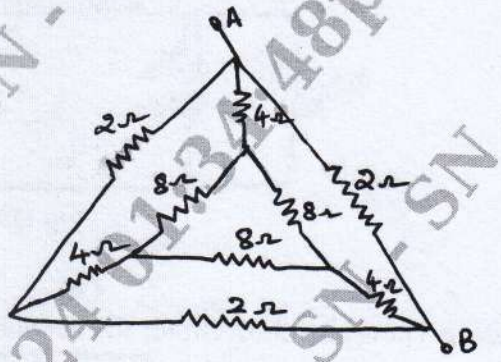

Fig Q1(c) **(06 Marks)**

OR

2 a. Obtain expressions to convert star connected impedances into equivalent delta connected impedances. **(06 Marks)**

b. Determine V_2 which results in zero current 8Ω resistor using mesh analysis for the circuit shown in Fig Q2(b)

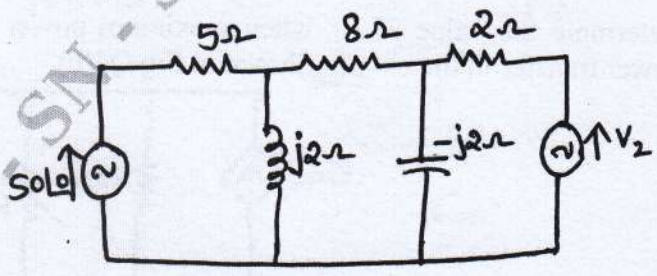

Fig Q2(b) **(07 Marks)**

c. Determine V_1, V_2, V_3 for the network shown in Fig Q2(c) using nodal analysis.

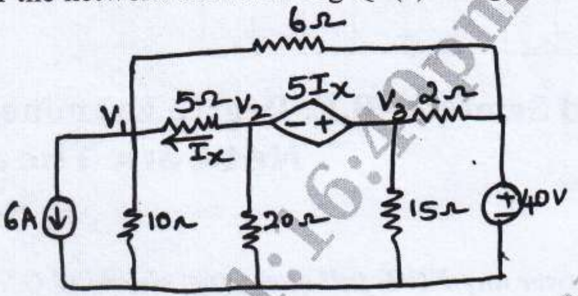

Fig Q2(c)

(07 Marks)

Module-2

3 a. Obtain Thevenins and Nortan's equivalent circuit for the network shown in Fig Q3(a)

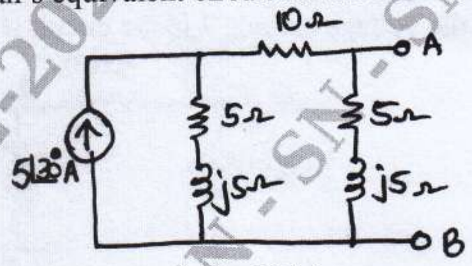

Fig Q3(a)

(08 Marks)

b. State and explain maximum power transfer theorem. (05 Marks)

c. Determine the voltage V_x across 30Ω resistor using superposition theorem for the network shown in Fig Q3(c)

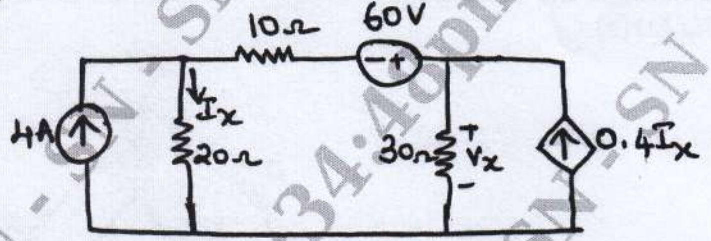

Fig Q3(c)

(07 Marks)

OR

4 a. Find V_x using Thevenins theorem for the network shown in Fig Q4(a)

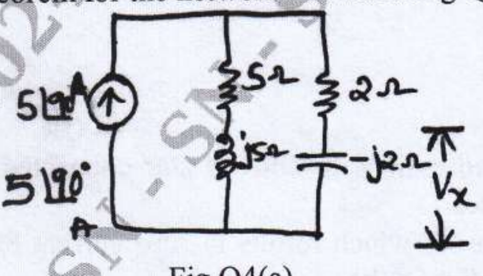

Fig Q4(a)

(06 Marks)

b. Determine the value of R_L when maximum power is transferred across it. Also find the power transfer in the circuit. Shown in Fig Q4(b)

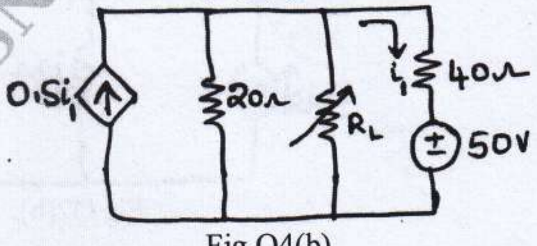

Fig Q4(b)

(08 Marks)

c. Determine current through R_L using Nortan's theorem for the network shown in Fig Q4(c)

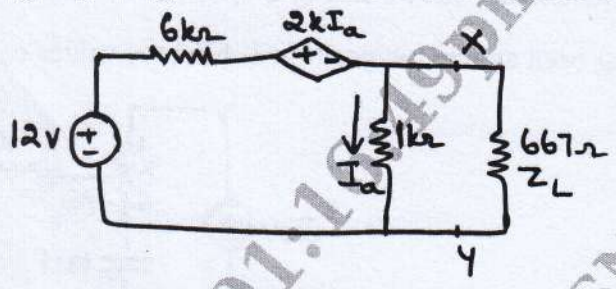

Fig Q4(c) **(06 Marks)**

Module-3

5 a. Explain the behaviour of R, L and C elements for transients. Mention their representation at the instant of switching. **(06 Marks)**

b. Determine i, $\frac{di}{dt}$, $\frac{d^2t}{dt^2}$ at $t = 0^+$ for the network shown in Fig Q5(b) when switch K is changed from position 1 to 2 at $t = 0$, steady state condition having reached before switching.

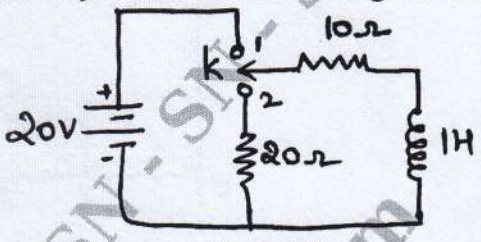

Fig Q5(b) **(07 Marks)**

c. For the network shown in Fig Q5(c), steady state is reached with switch K-open. Switch is closed at $t = 0$, solve for i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$ at $t = 0^+$.

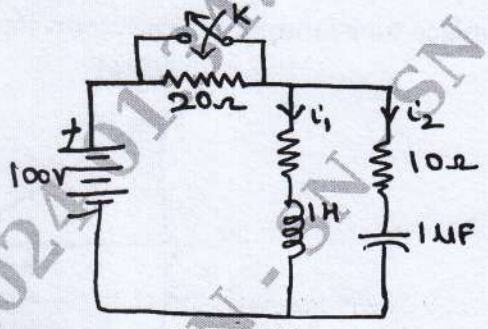

Fig Q5(c) **(07 Marks)**

OR

6 a. Derive an expression for transient response of series RC circuit for DC excitation. **(06 Marks)**

b. Determine the voltage $V_R(t)$ and $V_c(t)$ for $t \geq 0$ when switch is moved from position 1 to 2 for the network shown in Fig Q6(b)

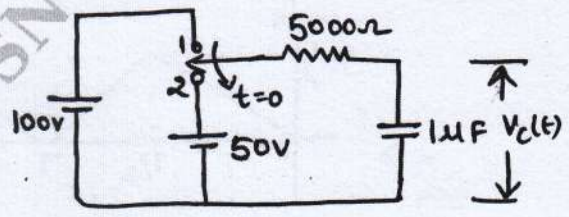

Fig Q6(b) **(08 Marks)**

c. For the network shown in Fig Q6(c), switch K is changed from 1 to 2 at t = 0, steady state having been attained in position 1. Find the values of i, $\frac{di}{dt}, \frac{d^2i}{dt^2}$ at t = 0.

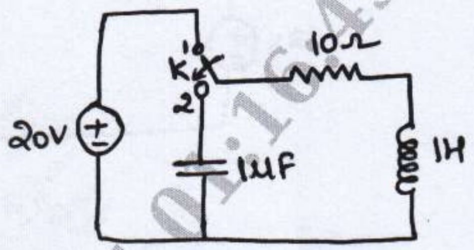

Fig Q6(c) **(06 Marks)**

Module-4

7 a. State and prove initial and final value theorem. **(06 Marks)**

b. Determine Laplace transform of the function shown in Fig Q7(b)

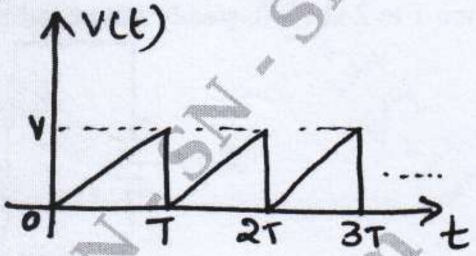

Fig Q7(b) **(06 Marks)**

c. Obtain Laplace transform of (i) δ(t) (ii) u(t) (iii) t (iv) Sinwt **(08 Marks)**

OR

8 a. Obtain Laplace transform for the waveform shown in Fig Q8(a)

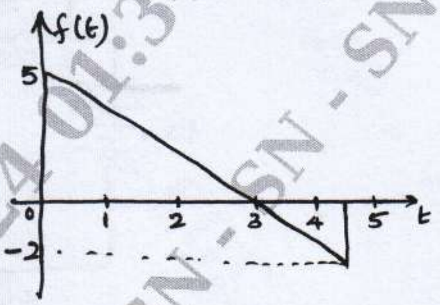

Fig Q8(a) **(08 Marks)**

b. Determine the relation between unit step and unit ramp function. **(04 Marks)**

c. Synthesize the waveform and find the Laplace transform of the waveform shown in Fig Q8(c)

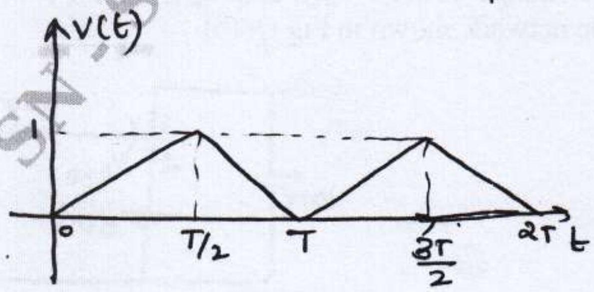

Fig Q8(c) **(08 Marks)**

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Module-5

9 a. Obtain Z-parameters interms of Y-parameters. **(06 Marks)**

b. A series RLC circuit has R = 4Ω, L = 1mH, C = 10μF, calculate Q-factor, Bandwidth, resonating frequency half power frequency. **(06 Marks)**

c. Determine ABCD parameters for the network shown in Fig Q9(c)

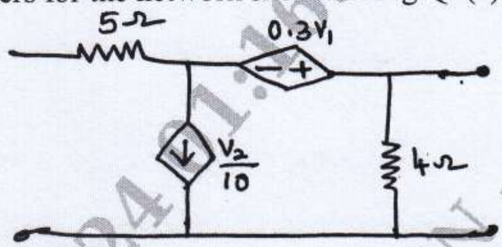

Fig Q9(c) **(08 Marks)**

OR

10 a. Derive an expression for resonant frequency of the circuit shown in Fig Q10(a)

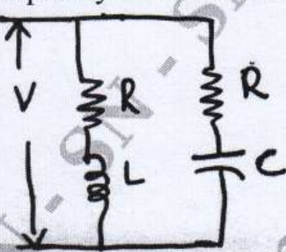

Fig Q10(a) **(06 Marks)**

b. Determine H-parameters and Y-parameters for the network shown in Fig Q10(b)

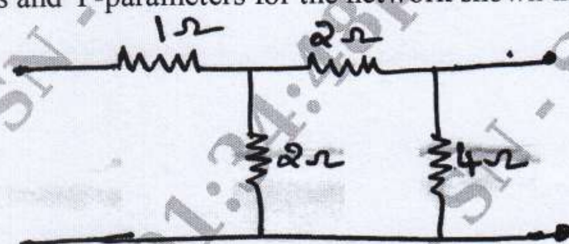

Fig Q10(b) **(08 Marks)**

c. Determine the value of R such that the circuit in Fig Q10(c) is resonant.

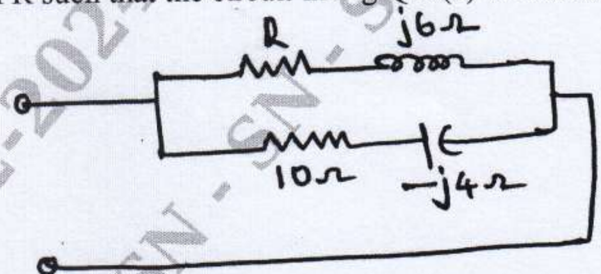

Fig Q10(c) **(08 Marks)**

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